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# Nutritional value of camel milk and *shubat*

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The camel milk composition is close to the cow milk composition for its rough components: lactose, total protein and fat matter. However, the fine composition and the biological activities of some of the components give to the camel milk, some peculiar nutritional properties, at the base of its reputation among the nomad culture (Figure 1). Fermented camel milk (*shubat*) has a slight different composition compared to fresh milk (Table 1).

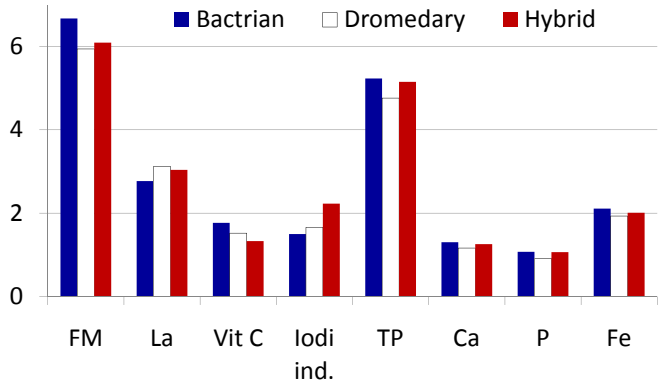


**Figure 1.** Comparative milk content of Bactrian, dromedary and hybrids milk from Kazakhstan.
**(FM**: Fat matter, %; **La**: Lactose, %; **VitC**: Vitamin C, ug/L; **Iodi ind.**: Iodine index; **TP**: Total protein, %; **Ca**: Calcium, g/L; **P**: Phosphorus, g/L; **Fe**: iron, mg/L)

Significant higher fat, protein, calcium, phosphorus, vitamin C in Bactrian milk, higher Iodine index in dromedary milk

**Table 1.** Some parameters of *shubat* composition from Kazakhstan

| Parameters | n | Mean and SD | Max | Min |
|---|---|---|---|---|
| pH | 22 | 4,08 ± 0,28 | 4,72 | 3,55 |
| Dornic, D° | 30 | 139 ± 29 | 189 | 86 |
| Vitamin C, mg/L | 24 | 156 ± 110 | 417 | 28 |
| Iodine index | 14 | 18,64 ± 11,27 | 52,79 | 6,98 |
| Total protein, % | 29 | 5,24 ± 1,33 | 8,84 | 1,88 |
| Calcium, g/L | 30 | 1,355 ± 0,224 | 1,877 | 1,030 |
| Phosphorus, g/L | 30 | 0,988 ± 0,317 | 1,800 | 0,111 |
| Iron, mg/L | 30 | 3,04 ± 1,95 | 9,10 | 0,80 |
| Urea, mg/l | 19 | 33 ± 44 | 150 | 0 |

The nutritional value includes two aspects:
(i) the contribution of the components to the requirements of different categories of population: **fatty acids, polypeptides, calcium and other essential minerals, vitamins** (table 2, 3),
(ii) the bioactive role of some of molecules naturally existing in the raw or fermented milk (**insulin-like protein, lactoferrine, immunoglobulin, lactoperoxydase, lysozyme,…**) or the probiotique role of **lactic bacteria** strains in fermented products as *shubat*.

**Table 2**. Comparative nutritive value of 5 types of milk

| Nutrient | Cow | Goat | Sheep | Buffalo | Camel |
|---|---|---|---|---|---|
| Energy (kcal) | 66 | 60 | 95 | 110 | 79 |
| Water (g) | 87.8 | 88.9 | 83.0 | 81.1 | 87.5 |
| Protein (g) | 3.2 | 3.1 | 5.4 | 4.5 | 3.4 |
| Fat (g) | 3.9 | 3.5 | 6.0 | 8.0 | 3.8 |
| Carbohydrate (g) | 4.8 | 4.4 | 5.1 | 4.9 | 4.5 |
| SFA(g) | 2.7 | 2.3 | 4.8 | 4.3 | 4.0 |
| MUFA(g) | 0.9 | 0.8 | 1.4 | 1.7 | 1.8 |
| PUFA(g) | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 |
| Cholesterol (mg) | 14 | 10 | 11 | 8 | 35 |
| Calcium (IU) | 120 | 100 | 170 | 195 | 130 |
| Vitamin C (mg/l) | 10 | 10 | 50 | 22 | 120 |
| Iron (mg/l) | 0.2-0.5 | 0.55 | 0.2-1.5 | 0.8-1.1 | 2.0 |

Most of the camel milk protein are more thermoresistant than in cow milk

**Table 3**. Comparative content of amino acid of camel, cow and goat milk

| | Camel | Cow | Goat |
|---|---|---|---|
| *Ala* | 2.8-3.4 | 3.5-4.8 | 3.6 |
| *Arg* | 3.2-4.6 | 2.9-4.2 | 2.1 |
| *Asp* | 6.2-7.7 | 6.2-7.8 | 7.4 |
| *Glu* | 15.4-23.9 | 15.8-23.2 | 20.3 |
| *Gly* | 0.6-1.7 | 0.8-2.1 | 2.1 |
| *His* | 2.5 | 3.0 | 5.0 |
| *Ileu* | 15.8-21.0 | 8.1-17.4 | 14.4 |
| *Lys* | 7.0-7.6 | 8.1 | 8.2 |
| *Met* | 2.5-3.5 | 3.2 | 3.5 |
| *Phe* | 4.6-5.7 | 5.4 | 6.0 |
| *Pro* | 11.1-13.3 | 10.1-11.8 | 14.6 |
| *Ser* | 5.9 | 6.6 | 5.2 |
| *Thr* | 6.3 | 4.3 | 5.7 |
| *Tyr* | 4.5-5.8 | 5.8 | 4.8 |
| *Val* | 6.1-7.4 | 7.5 | 5.7 |

The nutritional interest of camel milk is is richness in vitamin C, in iron, and in mono-unsatured fatty acids in spite of its higher cholesterol content. In that context, camel milk presents high interest to reach the nutritional requirements of the nomad people, but also for contributing to the health of the population by its beneficial properties.
However, further studies are necessary in order to confirm the empirical observations on the so called "therapeutic" properties of camel milk abundantly described by the camel farmers (antibacterial, anti-diabetic, anti-tumor role for example).

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